INTRODUCTION TO RINGS AND MODULES, MATH 323 - JANUARY-APRIL, 2020

1. General Information

- Instructor: Rachel Ollivier, ollivier@math.ubc.ca
- Course website:
  http://www.math.ubc.ca/~ollivier/Math323-2020.html
- Text: Dummit and Foote, Abstract Algebra.

Homework: There will be biweekly homework assignments posted on the website. The due date of each problemset will be specified. The first homework will be due on Thursday January 17 in class.

Tests: There will be one midterm exam (in class) and a final exam. The tests will be closed book-closed notes tests. Calculators will not be allowed. The date for the exams will be announced on the website. Book your travels accordingly.

Grades: Grades will be computed as:

- Homework 15%, Midterms 25%, Final exam 60%

Synopsis: The course will cover more or less Chapters 7-10 and 12. Highlights of the course will be an introduction to the vocabulary of exact sequences, projective, injective, flat modules (which should help prepare for later courses on homological algebra), as well as the classification of f.g. modules over a PID and its applications, in particular to the classification of finite abelian groups and to the reduction of linear operators.

2. Schedule

Here is a rough course schedule, subject to later adjustments.

- **Week 1.** 0.2, 0.3. Integers, Integers mod n. 7.1. Rings
- **Week 2.** 7.5 Field of fractions 7.4 Beginning of properties of ideals 7.3. Homomorphisms, Ideals, Quotient Rings.
- **Week 3.** End of the section 7.3 (more discussion of the so-called isomorphism theorem). Interlude: reminder on vector spaces and k-algebras.
- **Week 4.** 7.2 Polynomial rings, group rings.
- **Week 5.** 7.4. Properties of ideals continued (maximal and prime ideals).
- **Week 6.** 7.6. Chinese Remainder Theorem and applications. 8.1 Euclidean Domains.
  Winter break.
- **Week 7.** 8.2, 8.3 . PIDs and UFDs. 9.1, 9.2, 9.3, 9.4. Polynomial rings and UFDs, Irreducibility Criteria.
- **Week 8.** Midterm 10.1, 10.2, . Modules, Quotient Modules, Homomorphisms,
- **Week 9.** 10.3 Direct Sums. Free modules. 10.5 Exact sequences of modules, projective modules.
- **Week 10.** 12.1, 12.2, 12.3. Modules over PIDs and applications.
- **Week 11.** 12.3. More examples and discussions.
- **Week 12.**